

Application No.: 09/588,242

2

Docket No.: 249212024500

**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

Claim 1 (Previously Presented): An apparatus for producing a mass storage backup, the apparatus comprising:

an input for receiving mass storage write commands, said commands comprising data and a mass storage address at which the data is to be written;

a source of time information;

a circuit for associating a mass storage write commands with the time information to create a log entry; and

a storage for accepting log entries from the circuit, wherein the circuit queues log entries and periodically sends one or more of the queued log entries to the storage.

Claim 2 (Canceled).

Claim 3 (Previously Presented): An apparatus as in claim 1 wherein the storage for accepting the log entries further comprises:

a network connection for accepting the log entries and for providing said log entries into a network; and

a server for accepting log entries from the network and for providing the log entries to a log file on a log file mass storage device.

Claim 4 (Original): An apparatus as in claim 1 wherein the network is the Internet.

Claim 5 (Original): An apparatus as in claim 1 wherein the mass storage address at which the data is to be written comprises a sector address.

sf-1688252

Application No.: 09/588,242

3

Docket No.: 249212024500

Claim 6 (Original): An apparatus as in claim 1 wherein the storage for accepting log entries is the mass storage.

Claim 7 (Original): An apparatus as in claim 1 wherein the mass storage is a hard disk system.

Claim 8 (Original): An apparatus as in claim 1 wherein the storage for accepting log entries is a RAM based virtual disk.

Claim 9 (Currently Amended): A method for backing up a mass storage the method comprising:

accepting, at a log-assisted disk, mass storage write commands for the mass storage to be backed up;

appending, at the log-assisted disk, a time to each of said mass storage write commands to form a log entry;

queuing log entries in a log queue at the log-assisted disk; and

writing log entries from the log queue into a log file in a local mass storage different from the mass storage to be backed up.

Claim 10 (Original): A method as in claim 9 further comprising storing the log file in a non volatile storage.

Claim 11 (Canceled).

Claim 12 (Currently Amended): A method as in claim ~~11~~ 10 wherein the local mass storage is a hard disk.

Claim 13 (Original): A method as in claim 10 wherein the storing the log file in a non volatile storage further comprises:

sf-1688252

Application No.: 09/588,242

4

Docket No.: 249212024500

providing the log file to a network interface;  
using the network interface to couple the log file into a network;  
accepting the log file from the network; and  
storing the log file on a mass storage device.

Claim 14 (Original): A method as in 13 wherein using the network interface to couple the log file into a network further comprises:

receiving a status from the network;  
testing the status to determine if the network traffic is low; and  
coupling the log file into the network dependant on the network traffic.

Claim 15 (Original): A method as in claim 9 the method further comprising taking a snapshot of the mass storage to be backed up prior to accepting mass storage write commands for the mass storage to be backed up.

Claim 16 (Previously Presented): A method as in claim 9 wherein the step of writing log entries from the log queue into a log file further comprises:

determining the sector to be written to from the most recent log entry;  
searching for log entries having an earlier time stamp which writes to the same address; and  
deleting any log entries with an earlier time stamp which writes data to the same address as the most recent log entry.

Claim 17 (Previously Presented): A method of recreating the state of a mass storage device at a given time the method comprising:

accepting a snapshot of the state of a mass storage device taken at a point in time earlier than the given time;  
accepting log entries having timestamps later than the point in time of the snapshot;  
writing the snapshot to a storage device;

sf-1688252

Application No.: 09/588,242

5

Docket No.: 249212024500

writing the log entries having timestamps later than the point in time of the snapshot to the storage device; and

terminating the writing of the log entries when the timestamp of the log entry is equal to the given time.

Claim 18 (Previously Presented): A method as in claim 17 wherein the accepting a snapshot of the state of a mass storage device and accepting log entries from the time of the snapshot further comprises accepting a snapshot of the state of a mass storage device and accepting log entries from the point in time of the snapshot from a network connection.

Claim 19 (Original): A method as in claim 18 where the network is the Internet.

Claim 20 (Currently Amended): An article of manufacture comprising a computer readable media and computer code which causes a computer to:

accept mass storage write commands for a mass storage to be backed up at a log-assisted disk;

append a time to each of said mass storage write commands to form a log entry at the log-assisted disk;

queue log entries in a log queue at the log-assisted disk; and  
write log entries from the log queue into a log file in a mass storage different from the mass storage to be backed up.

Claim 21 (Previously Presented): A backup system for enabling continuous backup of computer data stored at a computer to a mass storage system, said backup system comprising:

a) an operating system for receiving write commands from an application installed on the computer and for converting each received write command into a sector write having a sector address and sector data;

b) a source of time information;

sf-1688252

Application No.: 09/588,242

6

Docket No.: 249212024500

c) a log-assisted disk for processing sector writes sent to the log-assisted disk by the operating system, said processing including receiving the sector writes, accumulating the sector writes, associating each sector write with the time information to create a log entry, and queuing log entries in a log queue;

d) a storage for accepting log entries from the log queue; and

e) means for communicating the log entry to the storage, wherein the operating system, the source of time information, the log-assisted disk, and the communicating means are in electrical communication with each other within a computer.

Claim 22 (Previously Presented): The backup system of claim 21 wherein the storage for accepting log entries is located within the computer.

Claim 23 (Previously Presented): The backup system of claim 21 wherein the storage for accepting log entries is in network communication with the computer.

Claim 24 (Previously Presented): The backup system of claim 23 wherein the communication means is a network interface card.

Claim 25 (Previously Presented): The backup system of claim 23 wherein the storage for accepting log entries receives log entries from multiple computers in a network.

Claim 26 (Previously Presented): The backup system of claim 23 wherein the network is the Internet.

Claim 27 (Previously Presented): The backup system of claim 21 wherein the storage for accepting log entries further comprises:

a) a network connection for accepting the log entries and for sending said log entries into network; and

sf-1688252

Application No.: 09/588,242

7

Docket No.: 249212024500

b) a server for accepting log entries from the network and for providing the log entries to a log file on a log file mass storage device.

Claim 28 (Previously Presented): The backup system of claim 21 wherein the storage for accepting log entries is a hard disk system.

Claim 29 (Previously Presented): The backup system of claim 21 wherein the storage for accepting log entries is a RAM-based virtual disk.

Claim 30 (Previously Presented): The backup system of claim 21 wherein the storage for accepting log entries is a non-volatile storage.

Claim 31 (Previously Presented): The backup system of claim 27 wherein the mass storage device is a hard disk system.

Claim 32 (Previously Presented): The backup system of claim 27 wherein the mass storage device is a non-volatile storage.

Claim 33 (Previously Presented): A method for continuously backing up computer data to a mass storage system, said method comprising:

- a) receiving write commands from an application running on a computer;
- b) converting each received write command to a sector write having a sector address and sector data;
- c) sending each sector write to a log-assisted disk;
- d) combining each sector write with a time stamp at the log-assisted disk to form a log entry;
- e) queuing log entries at the log-assisted disk;
- f) communicating the log entries to a mass storage system; and
- g) storing the log entries in a log file at the mass storage system.

sf-1688252

Application No.: 09/588,242

8

Docket No.: 249212024500

**Claim 34 (Previously Presented):** The method of claim 33 further including taking a snapshot of the data stored on the computer prior to receiving write commands.

**Claim 35 (Previously Presented):** The method of claim 33 wherein the mass storage system is in network communication with the computer.

**Claim 36 (Previously Presented):** The method of claim 33 wherein the mass storage system is located at the computer.

**Claim 37 (Previously Presented):** The method of claim 35 wherein communicating the log entries to the mass storage system is further defined by:

- a) providing the log entries to a network interface at the computer;
- b) using the network interface to couple the log entries into a network; and
- c) accepting the log entries from the network at the mass storage system.

**Claim 38 (Previously Presented):** The method of claim 33 wherein the step of storing the log entries in a log file is further defined by:

- a) determining a sector address to be written to from a received log entry;
- b) searching for log entries having an earlier time stamp which were written to the same sector address; and
- c) deleting any log entries with an earlier time stamp which were written to the same sector address as the received log entry.

sf-1688252